

APPENDIX C
GROUND SYSTEM FLIGHT READINESS TEST

C. COMMAND PLAN TESTS

This appendix provides detailed information on all of the command plan tests which will be conducted prior to the **SM2**. This information includes objectives of each test, resource requirements (personnel, facilities, software, hardware, etc.), roles and responsibilities of each organization, and projected test schedules.

C.1 SMGT-23 **Part 2** END-TO-END COMMAND PLAN TEST

SMGT-23 part 2 is an end to end execution of the command plan **and is** the final SMGT performed before the **SM**. This test will use all available simulators and hardware to execute as many of the command sequences as possible in an end to end fashion. This test will provide the last extensive test of the command plan prior to execution of the SM-2.

C.1.1 Test Objectives

- a. To execute, in end to end fashion, the entire SM2 command plan using engineering models and/or software simulators for **planned replacement flight hardware**.

C.1.2 Test Activities

SMGT-23 **Part 2** will consist of one test session. This test session is created to ensure that all test objectives and requirements covered by this SMGT are verified. A brief

description of this test session is covered in the following paragraph.

The test session will test all the command plan sequences that can be run using the available facilities. The test plan/procedure for SMGT 23 part 2 will be the command plan. This session will require review of the command plan to redline sequences that can-not be executed in the VEST. The resulting script will be run in the SMOR, and will be as close to the actual execution of the command plan as possible. Information on equipment states, timing and the correctness of the command plan will be obtained from this testing.

C.1.3 Test Method

SMGT 23 part 2 will try to execute as many of the sequences in the command plan as possible. This SMGT will be the final SMGT of the O&GS test program. The initial VEST configuration will simulate the servicing mission prior to HST grapple. The command plan will then be executed from preparations to grapple until HST release. Several communication modes will be simulated as the command plan is executed. All EVA activities will be executed using flight hardware, or using simulators or engineering models. The test will conclude with HST release.

C.1.4 Roles and Responsibilities

This Section identifies the SMGT-23 Part 2 support roles and responsibilities. (See Table C-1).

Table C-1. SMGT 23 Part 2 Resource Requirements

SUPPORT AREA	SYSTEM/RESOURCES	ORGANIZATION
STOCC	PRS PASS, AEDP ESS TALOS, TMS, PDB	LORAL/LMTO ATSC LORAL/LMTO/ATSC LMTO
DOC	AP/TTAC/COMM	ATSC
ST ScI	SPSS/PASS/OPUS/HDA	ST ScI
MSOCC	SPIF	ATSC
SOC	SOC SIMULATOR	ATSC
VEST	DF224/COP, NSSC-1 PCS & BRZ SIMULATOR	GSFC CODE 512 GSFC CODE 442
ITAV	N/A	CTA
SVG	N/A	MOSES
O&GS SMSE	N/A	GSFC CODE 441
SYSTEMS ENGINEERING	N/A	MOSES
IDT	N/A	GSFC CODE 442

The O&GS SMSE will serve as the test director. The O&GS SMSE responsibilities are:

- overall execution of the test.
- chair the TRR and insure that all resulting redlines are incorporated into the test plan/procedure prior to test execution.
- conduct the test pre-brief and post test briefing on the network.
- preside over the actual test execution.
- test flow.
- anomaly resolution.
- coordination of test personnel.
- approve realtime deviations to the test plan/procedure.

The Lead Organization will serve as the Test Coordinator. Test coordinator's responsibilities for the test are:

- attend the TRR.
- preparing the test plan/procedure.
- scheduling of the resources required to run the test.
- ensuring test prerequisites are satisfied prior to the test.
- collecting inputs to the test reports.
- issuing both the flash and final test reports.
- test set up, and post test set wrap up.

Code 442 will provide test support from the VEST. Code 442 VEST responsibilities are:

- attend the TRR.
- incorporate any special set up or commanding instructions into the test plan/procedure for the VEST interface.
- sign off on the test plan/procedure at the TRR.
- complete all necessary work orders prior to the test set up.
- monitor the test execution from building 29 and assist with any anomaly resolution.

ITAV will provide communications support during the SMGT.

ITAV responsibilities are:

- attend the TRR.
- issue the briefing message at least 48 hours prior to the test.
- establish all appropriate communication configurations required to execute the test during the VEST set up.
- maintain communications throughout the test.
- troubleshoot any communications problems during the test.

The MOSES **OST** will provide support during the SMGT. MOSES **OST** test conductor and participants responsibilities are:

- review the test plan/procedure.
- attend the TRR.
- support the test through pre and post test briefings.
- serve as test conductors.
- staff the consoles.
- send all commands contained in the test plan/procedure.

MOSES SE support will provide support for the SMGT. MOSES SE responsibilities are:

- support the plan/procedure writing phase to contribute to and review the test plan/procedure.
- attend the TRR.
- monitor a console during that portion of the SMGT that has commanding related to their subsystem.

Science Institute will provide support for the SMGT. Science Institute responsibilities are:

- attend the TRR.
- provide **the health and Safety SMS for pre-grapple and post deployment activities.**

The IDT and Code 680 teams will provide support for the SMGT. IDT and Code 680 teams responsibilities are:

- attend the TRR.
- provide technical support for troubleshooting and command plan activities.

C.1.5 System/Facility Requirements

This section identifies the interfaces and functionality required from each of the systems and/or facilities involved in SMGT-23 Part 2. This is a very resource intensive test. It is scheduled to run for 36 hours. Once the system is configured to support this test, it will remain configured until the test is complete. This test will require multiple shifts to complete.

VEST TEST FACILITY REQUIREMENTS

The test facilities that will be required to support SMGT-23 Part 2 are the VEST structure with a minimum of the DF-224/COP and NSSC-I computers, BRZ and any available **engineering units and the appropriate VEST simulator**. The PCS simulator will be used to supply PCS inputs to the DF-224/COP prior to grapple.

COMMUNICATION FACILITY REQUIREMENTS

SMGT-23 Part 2 will simulate the communication links between GODDARD and HST during the SM2. This means SMGT-23 Part 2 will be conducted in all communication modes, from TDRS direct to JSC mode. NASCOM and the SOC will be required to support this test. Data circuits will be configured at the start of the test by ITAV to simulate the TDRSS direct mode. ITAV will direct data circuit node channels, as required, throughout the test.

STOCC HARDWARE FACILITY REQUIREMENTS

SMGT-23 Part 2 will be conducted in the **SMOR**, with DOC support. The MVIPs and printers in the SEER will be required to support this test. A PRS AP, TTAC and high rate switch will also be required to support this test. These resources will be scheduled prior to test start by MOSES SVG. The STOCC software system requirements are listed above in Table C-1.

SMGT-23 Part 2 PERSONNEL SUPPORT REQUIREMENTS

SMGT-23 Part 2 test support will be required by the organizations listed in Table C-1. The O&GS SMSE will serve as the test director. MOSES SVG will serve as the Test Coordinator. VEST personnel will support the SMGT from Building 29, and the MOSES off-line team will man the consoles in the SEER. Normal daily DOC support will be used, no additional personnel are required in the DOC or NASCOM. One SOC person will be required to support the SMGT and maintain the JSC command link, and trouble shoot any communication problems that may occur during the test. The instrument developers from BASD will be required to support the SMGT and insure instrument safety and functionality. MOSES SE support will be required for the test to monitor the execution of the SMGT.

The following ground system elements will be required to support SMGT-23 Part 2:

C.1.5.1 PORTS Refurbishment System. The PRS system, Release 9.0, will be required to support test activities in SMGT-23 Part 2. PRS will be configured to support command generation and telemetry and dump processing. PRS will be required to support the following interface connections for SMGT-23: NASCOM (for connection to SOC and the VEST), PASS, ESS and the flight hardware. PRS will interface with NASCOM for the receipt of engineering telemetry and the transfer of real-time commands and OBC loads. PRS will interface with PASS for the transfer of engineering telemetry and the receipt of OBC loads. PRS will inter-face with ESS for the transfer of engineering telemetry.

C.1.5.2 POCC Application Software Support. The PASS system, Release 28, will be required to support test activities during the test session. PASS will support the following interface connections for SMGT-23 part 2: SPSS, PRS, and AEDP. During SMGT-23 part 2, PASS will interface with PRS for the receipt of engineering telemetry and AEDP for the transfer of telemetry subsets.

C.1.5.3 Astrometry and Engineering Data Processor. The AEDP system, Release 24, will be required to support test activities during SMGT-23 Part 2. AEDP will support the following interface connections: PASS, ESS, and OPUS. AEDP will interface with PASS for the receipt of telemetry captured during SMGT-23 Part 2. AEDP will interface with ESS and OPUS for the transfer of AEDP magnetic tape products.

C.1.5.4 Engineering Support System. The ESS system, Release 3.8, will be required to support test activities during SMGT-23 Part 2. ESS will support the following interface

connections: PRS, AEDP, and OPUS. ESS will interface with PRS for the receipt of real-time engineering telemetry and history tapes. ESS will interface with AEDP for the receipt of astrometry and engineering data tapes. ESS will interface with OPUS for the transfer or archived engineering data.

C.1.5.5 Telemetry Analysis and Logic for Operations Support.

The most current release of the TALOS system will be required to support test activities during SMGT-23 Part 2. TALOS will support the following interface connections: ESS. TALOS will interface with ESS for the receipt of HST engineering telemetry in the form of EDBs.

C.1.5.6 Thermal Monitoring System. The most current release of the TMS system will be required to support test activities during SMGT-23 Part 2. TMS will be required to interface with the ESS for the receipt of HST telemetry thermal data.

C.1.5.7 Project Data Base. The PDB, Release SMDB24, will be used during interface, regression testing, and all SMGT-23 Part 2 test sessions. A portion of the PDB files will be validated by MOSES SVG personnel and IDTs prior to test execution.

C.1.5.8 Science Planning and Scheduling System. The SPSS, Release Phase 2, will be required to support the following interface connections for SMGT-23 Part 2: AEDP. The OPUS will interface with AEDP for the receipt of engineering data.

C.1.5.9 Simulation Operations Center. The SOC will be required to support activities during SMGT 23 **Part 2**. The SOC will be required to interface with the VEST and the HST MOC. The SOC will provide these interfaces for the receipt of spacecraft engineering telemetry from the VEST, receipt of JSC commands from the HST MOC and the transfer of reformatted HST commands and JSC telemetry. The SOC will also receive JSC commands from the HST MOC which will be reformatted into TDRSS blocks and then routed to the VEST.

C.1.5.10 PCS Simulator. The PCS simulator will be required to support the portions of the test where HST is not grappled. This will require two DBC files to be generated to support this SMGT. This will be done by MOSES SVG and verified in the VEST.

C.1.5.11 Shuttle POCC Interface Facility. The SPIF, located within the Multi-Satellite Operations Control Center (MSOCC) in Building 14, will be required to provide the following interface connections: SOC and ESS. The SPIF will interface with the SSEAFD Simulator and SOC for the receipt and processing of JSC telemetry containing PPF and CAS data. The SPIF will interface with TMS and TALOS for the transfer of shuttle data.

C.1.6 Duration

Test Session - SMGT-23 **Part 2** - 36 hours

C.1.7 Dependencies

The dependencies for this test include:

- SMPART generated SMIT and command plan. This needs to be the latest version, and as close to the actual flight version as is possible. This should be available in softcopy.
- All SR-4 SM upgrades to ground system have been completed and verified.
- Level 2 certified PDB that contain all commands that will be executed in SMGT-23 Part 2.
- Completion of CODE 442 I&T of the all flight hardware.
- Successful completion of SMGT-22, 23 Part 1, 24, 25, 26 and 27.

C.1.8 Test Schedules

These are the planned dates for SMGT-23 Part 2 END-TO-END COMMAND PLAN activities, based on the most recent version of the O&GS Project Schedule.

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|-------------------------------|-------|
| - Test Plan/Procedure (Draft) | 11/96 |
| - Test Plan/Procedure (Final) | 12/96 |
| - TRR | 12/96 |
| - Session 1 Test | 12/96 |
| - Flash Test Report | 12/96 |
| - Test Report | 1/97 |